Toolkit to Support Financial Planning for Municipal Stormwater Programs

US EPA Region 9 Environmental Finance Center at Sacramento State
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Introduction

The EFC at Sacramento State is operated by the Office of Water Programs (OWP) at California State University, Sacramento. The EFC serves Region 9 state and local governments, tribal communities, and the private sector in the areas of financial planning and asset management. The goal of the EFC is to enable these entities to become capable of funding environmental and public health services, in the short term, and to be able to adapt to future needs as regulations, technology, and resources change.

In managing stormwater, municipalities throughout the U.S. must maintain conveyance infrastructure to mitigate urban flooding and comply with National Pollutant Discharge and Elimination System (NPDES) permits. As part of its applied research and outreach activities, the EFC developed *a stormwater financing toolkit* to assist communities in identifying short- and long-term municipal stormwater program expenses and developing a stormwater utility fee that may be used as (partial) revenue. The toolkit guides users in assembling costs for maintaining current assets, ensuring permit compliance, and building assets in the future. The toolkit also provides a means to record data and conduct calculations for estimating a stormwater utility rate structure, including an ability-to-pay analysis for residential property owners. The toolkit was assembled as part of direct municipal assistance in the EPA Region 9 jurisdiction and has been tested in real-life planning situations for municipal stormwater.

Like most analysis and modeling efforts, data collection and integration constitutes the majority of work. Stormwater utility managers may have to update or develop from scratch system asset inventories. Unit and program cost data will need to be mined from accounting records, and property and census data will need to be assembled to estimate key factors that support utility billing systems. The toolkit and this document were developed to guide the user in not just *what* to do, but *how* to do it and *where* to get the necessary data.

The document is divided into the following sections:

I. Background
II. Assembling Program Costs and Evaluating Revenues
III. Preview of the EFC Stormwater Financing Toolkit

Section I discusses the needs, challenges, and approaches in California and elsewhere in the U.S. for financing stormwater programs. Section II describes how asset management can be used to develop and refine stormwater financing programs and references various Microsoft Excel-based workbooks that comprise the stormwater financing toolkit. Section III lists each of the toolkit materials and how the items can be assembled to evaluate program costs and potential revenue from stormwater utility fees.

I. Background

Throughout the U.S., municipalities fund water management and infrastructure in many ways. Traditionally, revenues from water sales pay for operations and maintenance of systems. Wastewater and stormwater services are often funded through connection and use charges, with property owners paying a one-time fee to connect with municipal systems and then paying regular fees based on intensity of use. In some areas of the Western U.S., designated special districts have jurisdiction to assess residents with similar "special" fees to pay for services and infrastructure development. Such districts are used extensively in California for many types of activities, dating back to the establishment of authority for irrigations districts in 1887 through the state's Wright Act.

As municipalities in the U.S. developed, they first organized water supply and then wastewater management activities to promote public health. Local and federal investments in water treatment and supply occurred long before stormwater (NRC 1984). The Clean Water Act Amendments, which established federal authority for regulating dispersed (non-point source) pollutants such as stormwater, were only enacted in 1987. Partly as a result, funding streams for water and wastewater operations are more robust than for stormwater. In western states, funding gaps are common in the stormwater sector (Hanak et al 2013).

To pay for stormwater management and permit compliance in the absence of dedicated funds, municipalities often draw on general funds, use smaller line-item funding streams such as fees for newly developed land, or capitalize on funding from other municipal departments and divisions. This poses several challenges for municipal finances. First, using general funds means that stormwater infrastructure competes directly with other services. Second, localities throughout the country have varied and unequal opportunities for raising revenue, resulting in disparities in municipal capacity for establishing revenue streams. In California, one of the states covered by EPA Region 9, localities face unique constraints in raising revenue, such as restrictions on increasing local property tax assessments. Finally, funding stormwater infrastructure management through general fund sources disperses the costs of infrastructure management unevenly. Runoff is correlated with impervious surface cover, and high-risk land uses such as automotive facilities or industrial sites must be specially considered. These properties should pay a fee proportionate to their contributions, which would not occur when funding stormwater program costs through General funds. For these reasons, developing dedicated and equitable funding streams for stormwater can significantly improve municipal finances.

To stabilize funding, some municipalities implement more dedicated funding streams. Municipal stormwater utility fees and taxes are one vehicle used to assess residents for the costs of managing stormwater systems. Rate structures can be based on one of several methods that incorporate data for socio-demographic and property characteristics. Additionally, municipalities often assess connection charges to builders and developers for interconnecting new properties with existing systems. Some residents or businesses might be assessed NPDES-related inspection fees to pay for stormwater permitting activities. For larger new developments, municipal regulations can even require developers to implement neighborhood or regional stormwater management infrastructure, referred to as best management practices (BMPs) or Stormwater capture measures (SCMs).

However, municipalities also use other methods to raise revenue for stormwater management. Some re-apportion funds from other relevant departments or division programs. For example, stormwater managers can work with transportation sector managers to implement SCMs near roads and other transit features. Additionally, states such as California rely heavily on voter-approved, general obligation bond funding for water infrastructure planning and development projects. Several proposition measures over the past decade have contained funding that is available for stormwater planning and development (Ajami and Christian-Smith 2013).

Beyond regional funding, some national-level funding sources support stormwater management. The Clean Water State Revolving Fund from the U.S. EPA offers low-interest loans for, among other activities, stormwater infrastructure improvements and restoration projects. Municipal borrowers identify a source for paying back the loans over time, which can include stormwater utility fees, developer fees, and other fees not directly related to stormwater management (US EPA 2016).

Additionally, some innovative revenue sources are being explored or implemented. Stormwater infrastructure improvements can be jointly-funded projects with other governments or municipal departments. In the city of Long Beach, CA, for instance, the municipality partnered with the California State Department of Transportation to undertake stormwater infrastructure improvements that included a highway corridor. Conceptual inspiration for funding water management are also borrowing from other sectors. The electricity sector, for example, offers examples of new revenue sources. As one mechanism, on-bill charges, which are assessed at a fixed rate, are often used to pay for consistent infrastructure costs such as electric transmission lines. Additionally, in California, a “public goods” charge is included for all rate-payers, which funds renewable energy research and implementation programs. Green bonds, special bonds dedicated for specific purposes with special financing terms, have also been discussed for water management. Recent studies have examined applicability of these innovative funding mechanisms for urban water management (Stanford et al. 2015). Finally, a variety of innovative public-private funding arrangements are emerging, aligning public agencies with private sector investors to provide services.

Municipalities can survey all of these options in devising a long-term strategy that supports stormwater programs and new infrastructure in their communities.

II. Assembling Program Costs and Revenues

Any approach to paying for urban stormwater management requires assessing costs of current and future systems, as well as estimating potential revenues. Asset management is a key process that helps identify and prioritize current and future program costs to support long-term investments. It assists in development of revenue sources and assessments of financial impact on communities and municipalities. The EFC used asset management in developing guidance materials for municipalities to estimate stormwater program costs and evaluate potential revenue that will be needed to sustain their programs. Asset management, which traditionally involves current and future management of existing assets, can be combined with NPDES permit compliance needs and long-term stormwater management plans (for both water quality and drainage improvements) to develop a stormwater financing program.

The EFC's approach to develop such a program involves the following multi-step procedure:

1. Create an asset inventory
2. Define levels of service (LOS) for maintaining assets
3. Estimate program costs for
    a. Operation and maintenance (O&M) of existing assets
    b. Permit compliance activities
    c. Capital & O&M for future buildout
4. Conduct a financial capability analysis
5. Develop a rate structure
6. Determine remaining funding gaps
7. Recommend additional revenue options
8. Disseminate information and engage stakeholders

Each of these steps is described below, with references to various components of the EFC's stormwater financing toolkit as applicable.

II.A. Creating an Asset Inventory

To assist in estimating a municipality's total stormwater program costs, asset management tools are valuable. Many such tools exist. They all allow municipal stormwater managers to document the process of creating and prioritizing an organized inventory of stormwater infrastructure, which can include gravity mains, detention basins, green infrastructure, manholes, and other components. Such tools range from simple tabular templates such as that provided by EPA (2003, Figure 1) to sophisticated proprietary software databases that can contain built- in cost resources and/or decision making functionality (Figure 2).

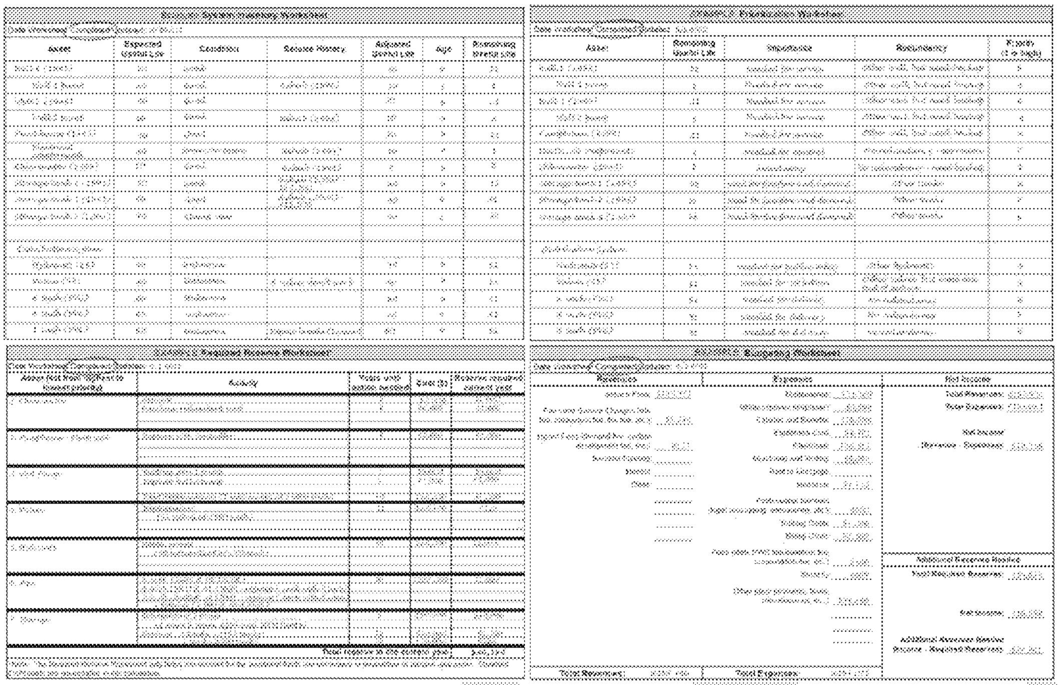


Figure 1. Example of Simple Asset Management Templates (EPA 2003)

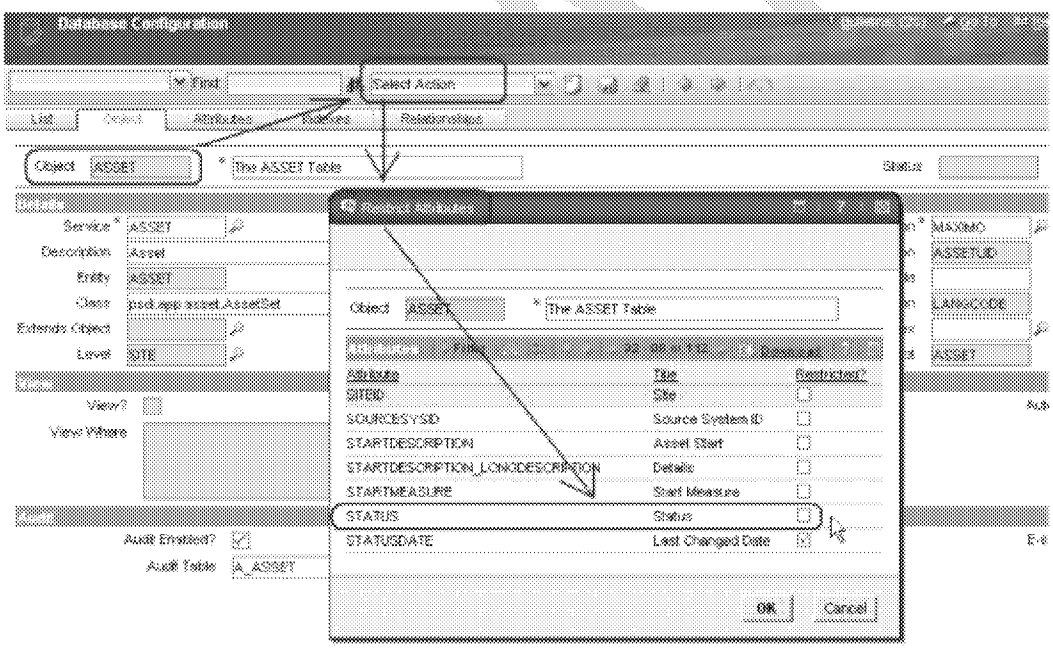


Figure 2. Example of Comprehensive Asset Management Software (IBM 2018)

The EFC developed an *asset inventory workbook* as part of its asset management toolkit. The asset inventory method followed in the workbook is a synthesis of several documented asset management approaches. In particular, one method was developed by the City of Grand Rapids Michigan to create its *Stormwater Asset Management and Capital Improvement Plan* (Grand Rapids, 2016). Another useful resource was developed by the EPA and documented in the paper *Asset Management: A Handbook for*

Small Water Systems (EPA, 2003). Of these two, the Grand Rapids approach for asset prioritization is straightforward and easily adaptable, but it may be unnecessarily thorough and detailed for many municipalities with smaller stormwater infrastructure systems. Combining the Grand Rapids mathematical method and elements from the EPA method, which is easier to follow but lacks details to support decision making, allowed the EFC to develop a comprehensive, openly-available, and user-friendly workbook template.

The EFC's asset inventory workbook stores common asset characteristics such as asset type, material, age, estimated expected life (EEL), and others. These characteristics are used to calculate two factors that contribute to a prioritization rank for planning maintenance and replacements: the probability of failure (POF) and the consequence of failure (COF). The POF estimates the likelihood of asset failure compared to other assets, based on an assessment of the asset's age and/or condition. The COF estimates the impacts of a component outage, based on knowledge of the difficulty and cost for replacement, as well as impact on other community assets, services, and resources. The asset inventory workbook estimates these POF and COF scores to evaluate an overall risk of failure. The overall risk, then, helps determine and prioritize assets for repair or replacement in current and future years, based on identified *Levels of Service*, as described below.

II.B. Defining Levels of Service

Level of Service (LOS) is a measure of the quality or expected reliability that must be provided by an asset to meet a community's basic needs and expectations (Grand Rapids, 2016). It is essentially a description of the extent of O&M activities performed for various assets. LOS's can have varying degrees of scope and scale. Examples of LOS's range from ones that focus on meeting needs as they arise (a reactive level), to ones that more proactively undertake system maintenance and renewal activities (a preventative level).

The EFC method uses a LOS approach similar to that used by Grant Rapids, categorizing O&M activities to help distinguish and define multiple LOS's. Defining multiple LOS's allows municipalities to consider and present options to stakeholders in a sort of cost-benefit comparison analysis, in interest of best serving the community and making good on investments. The O&M categories are as follows:

- Inspections
- Preventative maintenance
- Corrective maintenance
- Replacement

Inspection activities can include visual assessments and in-pipe inspections with cameras. Corrective maintenance is maintenance performed to fix a problem with an asset; repairs and partial replacement are included, but complete replacement of the asset is excluded. Preventative maintenance includes actions performed to increase the effective life of the asset or improve its performance, (i.e., lining a pipe, removing accumulated sediment, removing tree roots, etc.). System renewal is the complete removal and replacement of an asset.

The EFC method establishes a *baseline LOS* intended to identify O&M activities currently performed (or to be performed). An example of the baseline LOS defined by Grand Rapids is provided in Table 1. (Note that although Grand Rapids does not include green infrastructure [GI], low impact development [LID], or best management practices/stormwater control measures [BMPs/SCMs], the EFC method provides means for including these assets.) The baseline LOS represents a minimum service effort likely due to a limited O&M budget and the lack of an asset management plan. There are no scheduled preventative maintenance operations or system renewals planned. Instead, assets are replaced or repaired as they fail.

Table 1. Baseline Level of Service Definition (Grand Rapids, 2016)

Asset	Inspection	Corrective (Maintenance)	Preventative (Maintenance)	System Renewal
Gravity Mains	---	Respond to failures and complaints for all sewer components.	---	---
Force Mains	Visual inspection every 2 weeks during pump station inspection.	---	---	---
Catch Basins	---	Clean 2500 annually and perform corrective maintenance.	---	---
Outfalls	---	---	---	---
Detention Basins	---	---	---	---
Culverts	---	Clean debris and perform corrective maintenance.	---	---

Successive, more advanced LOS's can have an increase in the type and frequency of inspections and maintenance and accelerate the process of replacing assets. More proactive (higher) LOS's would replace assets before their end-of-life and reduce the risk of undesired failures and outages. A higher LOS is typically more expensive from a purely maintenance cost perspective, though it may actually save money when considering total life-cycle costs. Table 2 and Table 3 show examples of higher levels of service considered by Grand Rapids. The LOS in Table 2, which is more proactive than the baseline, shows that every asset type has a plan for system renewal and inspection. Most asset types also have plans for corrective and preventative maintenance of components.

Table 2. Moderate Level of Service Definition (Grand Rapids, 2016)

Asset	Inspection	Corrective Maintenance	Preventative Maintenance	System Renewal
Gravity Mains	PACP[1] CCTV[2] inspect pipes greater than 75 years old over 10-year period.	Replace 15% of assets that have reached end of EEL over 10 years.	Perform rehabilitation to extend EEL for 10% of inspected sewers over 10 years.	Replace every 150 years.
Force Mains	Visual inspection every 2 weeks during pump station inspection. PACP CCTV inspect every 15 years.	---	---	Replace every 100 years.

Asset	Inspection	Corrective Maintenance	Preventative Maintenance	System Renewal
Catch Basins	Clean and inspect 25% annually (Approx. 4264). Record and monitor debris levels for cleaning prioritization.	Clean 2500 annually and perform corrective maintenance.	Replace 15% of assets that have reached end of EEL over 10 years.	Replace every 100 years.
Outfalls	Inspect all outfall points every 5 years per MS4[3] requirements.	Replace top 10% by POF each cycle.	Stabilize bank and erosion control at 5% of assets each cycle.	Replace every 150 years.
Detention Basins	Complete site inspection 3 times annually including routine maintenance.	---	---	Facility renovation every 100 years. Includes regrading, seeding, renew inlet/outlet structures.
Culverts	CCTV/walk/inspect 50% of culverts annually.	Replace/rehabilitate top 5% by POF.	Clean 20% of all assets annually.	Replace every 150 years.

[1] *Pipeline Assessment Certification Program*
[2] *Closed-Circuit Television*
[3] *Municipal Separate Storm Sewer System*

Table 3. Advanced Level of Service Definition (Grand Rapids, 2016)

Asset	Inspection	Corrective (Maintenance)	Preventative (Maintenance)	System Renewal
Gravity Mains	PACP CCTV inspect pipes greater than 50 years old over 10-year period.	Replace 30% of assets that have reached end of EEL over 10 years.	Perform rehabilitation to extend EEL for 10% of inspected sewers over 10 years. Clean 20% of all assets annually.	Replace every 125 years.
Force Mains	Visual inspection every 2 weeks during pump station inspection. PACP CCTV inspect every 10 years.			Replace every 100 years.
Catch Basins	Clean and inspect 35% annually (Approx. 5969). Record and monitor debris levels for cleaning prioritization.	Replace 30% of assets that have reached end of EEL over 10 years.	Perform rehabilitation to extend EEL for 10% of inspected catch basins over 10 years.	Replace every 75 years.
Outfalls	Inspect all outfall points every 3 years to satisfy MS4 requirements.	Replace top 10% by POF each cycle.	Stabilize bank and erosion control at 10% of assets each cycle.	Replace every 125 years.

Asset	Inspection	Corrective (Maintenance)	Preventative (Maintenance)	System Renewal
Detention Basins	Complete site inspection 3 times annually including routine maintenance.			Facility renovation every 75 years. Includes regrading, seeding, renew inlet/outlet structures.
Culverts	CCTV/walk/inspect 50% of culverts annually.	Replace/rehabilitate top 10% by POF.		Replace every 125 years.

The EFC method suggests establishing the baseline LOS as the O&M activities that are currently performed. Defining successive LOS's, however, can be harder, even daunting, to define. The EFC method suggests, as a good place to start, using the POF and COF scores determined from the asset inventory workbook. Recall that the POF estimates how likely an asset is to fail compared to other assets, based on an assessment of the asset's age and/or condition, and the COF estimates the impacts of a component outage based on knowledge of the difficulty and cost for replacement, as well as impact on other community assets, resources, and services. The COF and POF can be combined through a simple table or matrix, as shown in Figure 3, to qualitatively categorize the risk associated with the component's failure and compare risks among assets. The risk categories are:

- High COF and high POF – high risk
- High COF and low POF – moderately high risk (due to high COF)
- Low COF and high POF – moderately low risk (due to low COF)
- Low COF and low POF – low risk

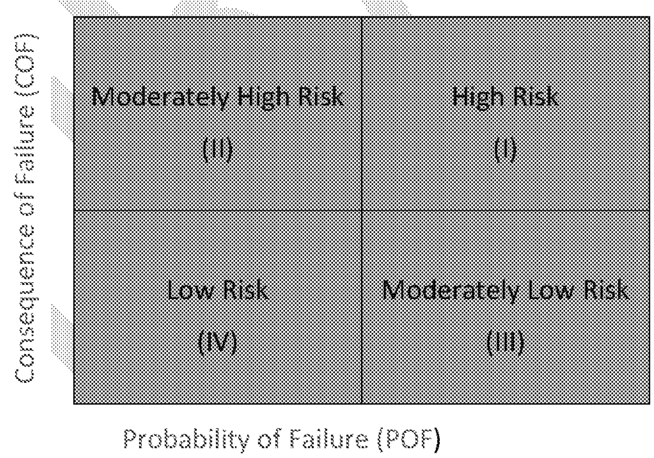


Figure 3. Matrix of Asset Risk Categories based on COF and POF

Assets falling into the higher risk categories should be given higher priority for O&M activities, and so the matrix (categories) can be used to help define LOS options beyond the baseline. The EFC recommends defining a *high LOS* and a *moderate LOS* (based on improvements to the baseline) as described below.

A high LOS plan is intended to substantially reduce the risks of failure and improve long-term cost optimization over the baseline LOS. In particular, the goal of a high LOS is to reduce failure of assets with high consequences or probabilities of failure and maximize the effective life of low risk assets. To do this, a schedule is developed that 1) prioritizes replacement of assets with high consequences or probabilities of failure (quadrants I, II, and III in Figure 3), and 2) establishes inspection and preventive maintenance activities for all assets to reduce failure risk before scheduled replacement. For high LOS plans, the following steps should be taken:

1. *Establish System Renewal Schedules*
   High risk assets (i.e., those in quadrant 1 of Figure 3) should receive the highest priority for replacement due to high probability and consequence of failure. Moderately high risk assets (quadrant II) should have the next highest priority for replacement, as their consequence of failure is high. Assuming a high LOS follows a proactive program that seeks to minimize failures, moderately low risk assets (quadrant III) would be next on the schedule for replacement because, although the consequence of failure is relatively low, the likely hood is high. Low risk assets (quadrant IV) can be scheduled for replacement at the end of their expected effective life.
2. *Establish Inspection Schedules*
   Once a system renewal timeline is established, determine an inspection timeline necessary to prevent asset failure until the asset is scheduled for replacement. The inspection schedule will be more frequent than in the baseline LOS, and more types of inspection activities may be necessary. It may be most efficient to schedule inspections according to asset categories, where a percentage of the assets within the same category are inspected on the same frequency, and rotated across time. For example, if there are 10,000 drain inlets and they have a low risk of failure, a reasonable inspection schedule might be 1,000 drain inlets per year, with all drain inlets inspected on a ten-year cycle.
3. *Establish Preventative Maintenance Schedules*
   Similar to inspections, establish preventative and corrective maintenance schedules to prevent failure until the asset's scheduled time of renewal. This will likely be more frequent than that for the baseline LOS and may include more types of maintenance activities. A good source for determining maintenance activities and frequencies would be manufacturer recommendations.

A moderate LOS plan is intended as an improvement upon the baseline LOS, but not to the extent of the high LOS. The goal of the moderate LOS is to reduce corrective action and failure of assets with high consequences of failure and delay failure of assets with low consequences. To do this, a schedule is developed to 1) prioritize replacement of all assets with high consequences of failures, and 2) establish inspection and preventive maintenance activities for all assets to reduce the probability of failure. For moderate LOS plans, the following steps should be taken:

1. *Establish a System Renewal Schedule*
   As with the high LOS, high risk assets (quadrant I) should have the highest priority for replacement, moderately high risk assets (quadrant II) should have second priority, and low risk assets (quadrant IV) can be inspected and maintained with replacement planned for the end of their expected effective life. Moderately low risk assets (quadrant III) can merely be inspected and maintained to maximize their effective life, in lieu of making their replacement a priority.

Although their probability of failure is high, the consequence is relatively low, justifying delay of replacement until failure occurs. An increase in inspections of these assets will help minimize costs and consequences.

2. *Increase the Frequency of Inspections and Maintenance used for the Baseline LOS*
   Inspections and preventative maintenance have a low cost relative to corrective maintenance or system renewal. Increasing these activities can reduce asset failure rates and prolong asset life.

II.C. Estimating Costs

The EFC method for estimating costs associated with municipal stormwater programs breaks expenses into the following three groups:

- O&M of existing assets
- Permit compliance
- Future buildout

Typical expenses associate with each of these is summarized below.

Costs for O&M of Existing Assets

Costs associated with O&M of the existing infrastructure system, including both grey (drainage) and green (water quality) assets, must be estimated. The asset inventory and LOS drive the cost estimates. Presumably existing costs will represent the existing (baseline) LOS, while future costs will depend on the desired future LOS, including inflation estimates.

Data for these estimates can originate from a number of sources. For instance, a municipal stormwater management department may have records of the costs associated with the LOS activities. Alternatively, analysis can collect data for unit and fixed costs of various materials and labor from similar projects, to the extent that data is available.

Grand Rapids (2016) provides a good example for how to organize expenses associated with O&M activities of existing assets. Table 4 shows costs associated with their baseline LOS (defined in Table 1), while Tables 5, 6, and 7 show the higher costs associated with more frequent program activities and system renewal actions (i.e., the higher LOS's presented in Table 2 and Table 3). Table 7 is the most robust. Comparing the cost estimates for several LOS scenarios allows utility managers opportunities and tradeoffs in the aggressiveness of maintenance and the associated costs.

Note that the costs presented in Table 4 through Table 7 are considered "Year 1", or current costs. Costs for future years can be projected by applying inflation factors.

The EFC toolkit includes worksheets for documenting and calculating the O&M activities and associated costs.

Table 4. Baseline LOS Annual Cost (Grand Rapids, 2016)

Asset	Inspection	Corrective (Maintenance)	Preventative (Maintenance)	System Renewal	Total
Gravity Mains	$0	$200,000	$0	$1,537,000	$1,737,000
Force Mains	Cost is associated with pump station inspections	$0	$0	$0	$0
Catch Basins	$0	$600,000	$0	$0	$600,000
Outfalls	$0	$0	$0	$0	$0
Detention Basins	$0	$0	$0	$0	$0
Culverts	$0	$20,000	$0	$0	$20,000
Subtotal of Asset Classes	***$0***	***$820,000***	***$0***	***$1,537,000***	***$2,357,000***
O&M (inspection, corrective and preventative maintenance)					$820,000
Capital Renewal (system renewal)					$1,537,000
Total					**$2,357,000**

Table 5. LOS C Annual Cost (Grand Rapids, 2016)

Asset	Inspection	Corrective (Maintenance)	Preventative (Maintenance)	System Renewal	Total
Gravity Mains	$110,000	$299,000	$647,000	$2,439,000	$3,495,000
Force Mains	$200			$1,000	$1,200
Catch Basins	$639,000	$24,000	$14,000	$560,000	$1,237,000
Outfalls	$28,000	$66,000	$1,200	$12,000	$107,200
Detention Basins	$6,500			$11,300	$17,800
Culverts	$9,700		$43,000	$11,000	$63,700
Subtotal of asset classes	***$793,400***	***$389,000***	***$705,200***	***$3,034,300***	***$4,921,900***
O&M (inspection, corrective and preventative maintenance)					$1,887,600
Capital Renewal (system renewal)					$3,034,300
Total					**$4,921,900**

Table 6. LOS B Annual Cost (Grand Rapids, 2016)

Asset	Inspection	Corrective (Maintenance)	Preventative (Maintenance)	System Renewal	Total
Gravity Mains	$212,000	$598,000	$1,207,000	$ 2,927,000	$4,944,000
Force Mains	$300	$0	$0	$1,400	$1,700
Catch Basins	$894,000	$48,000	$26,000	$746,000	$1,714,000
Outfalls	$47,000	$142,000	$6,000	$14,000	$209,000
Detention Basins	$6,500	$0	$0	$15,000	$21,500
Culverts	$9,700	$86,000	$0	$14,000	$109,700
Subtotal of Asset Classes	***$1,169,500***	***$874,000***	***$1,239,000***	***$3,717,400***	***$6,999,900***
O&M (inspection, corrective and preventative maintenance)					$3,282,500
Capital Renewal (system renewal)					$3,717,400
Total					**$6,999,900**

Table 7. LOS A Annual Cost (Grand Rapids, 2016)

Asset	Inspection	Corrective (Maintenance)	Preventative (Maintenance)	System Renewal	Total
Gravity Mains	$482,000	$996,000	$3,252,000	$8,388,000	$13,118,000
Force Mains	$500	$0	$0	$1,800	$2,300
Catch Basins	$1,276,500	$80,000	$94,000	$1,119,000	$2,569,500
Outfalls	$47,000	$142,000	$27,000	$1,700	$217,700
Detention Basins	$6,500	$0	$0	$22,500	$29,000
Culverts	$19,300	$0	$86,000	$17,000	$122,300
Subtotal of Asset Classes	***$1,831,800***	***$1,218,000***	***$3,459,000***	***$9,550,000***	***$16,058,800***
O&M (inspection, corrective and preventative maintenance)					$6,508,800
Capital Renewal (system renewal)					$9,550,000
Total					**$16,058,800**

Costs for Permit Compliance

Most municipal stormwater programs must comply with NPDES permits. Required activities can be categorized according to common, primary elements of NPDEs permits. The EFC toolkit categorizes NPDE permit requirements into the following core elements:

1) Construction Site Stormwater Runoff Control
2) Illicit Discharge Detection and Elimination
3) Industrial and Commercial Management
4) Pollution Prevention/Good Housekeeping for Municipal Operations
5) Post Construction Stormwater Management for New/Re-Development
6) Public Education, Outreach, Involvement, and Participation
7) Water Quality Monitoring
8) Overall Stormwater Program Management

In addition, municipal programs must address long-term planning activities required for state-wide trash policy compliance, Total Maximum Daily Load (TMDL) compliance, or watershed management coordination. Costs associated with each of the core permit elements and long-term planning must therefore be accounted for. Typical expenses include administrative and maintenance staff labor, equipment, materials, and perhaps contracted services. Once the costs of the current year or a recent year have been determined, costs for future compliance can be estimated using inflation factors.

Note that some permit compliance activities and costs (e.g., good housekeeping for municipal operations) may have already been accounted for under O&M of existing assets. Care should be taken to avoid duplicating costs. Also, some permit required activities such as those required for TMDL compliance can qualify as either "long-term planning for permit compliance" or as future buildout costs (the latter is discussed in the next subsection). It is up to the discretion of the municipal planners and managers as to where to claim these expenses, so long as they are not duplicated.

A screen shot of the EFC worksheet for total permit compliance costs is show in Figure 4. Figure 5 shows of one of the EFC's permit compliance core element costs worksheets. Grand Rapids (2016) did not include NPDES permit compliance expenses in their financial stormwater plan.

Category #	Activities	Current Annual Costs	Yr 1 Costs	Yr 2 Costs	...	Yr 17 Costs	Yr 18 Costs	Yr 19 Costs	Yr 20 Costs
1	Construction Site Stormwater Runoff Control	$ -	$ -	$ -	...	$ -	$ -	$ -	$ -
2	Illicit Discharge Detection and Elimination	$ -	$ -	$ -	...	$ -	$ -	$ -	$ -
3	Industrial and Commercial Management	$ -	$ -	$ -	...	$ -	$ -	$ -	$ -
4	Pollution Prevention/Good Housekeeping for Municipal Operations	$ -	$ -	$ -	...	$ -	$ -	$ -	$ -
5	Post Construction Stormwater Management for New/Re-Development	$ -	$ -	$ -	...	$ -	$ -	$ -	$ -
6	Public Education, Outreach, Involvement, and Participation	$ -	$ -	$ -	...	$ -	$ -	$ -	$ -
7	Water Quality Monitoring	$ -	$ -	$ -	...	$ -	$ -	$ -	$ -
8	Overall Stormwater Program Management	$ -	$ -	$ -	...	$ -	$ -	$ -	$ -
9	Long-Term Planning (e.g., Trash Amendment, TMDL Compliance, Watershed Management Coordination)	$ -	$ -	$ -	...	$ -	$ -	$ -	$ -
					...				
	Subtotal	$0	$0	$0	...	$0	$0	$0	$0
	Yr 2 costs and beyond are based on assumed inflation factor:	3%							
	Assumes Current year is:	2018							

Figure 4. Screen Shot of EFC Permit Compliance Costs Summary Worksheet

Water Quality Monitoring

Cost Items	Labor Costs			Miscellaneous Costs				Total Cost		Existing Funding	Funding Source
	# FTE	Salary + Fringe + Accrual	Labor Cost	Units	Cost/Unit	# of Units	Miscellaneous Cost				
Labor - student intern			$ -					$ -			
Labor - stormwater staff			$ -					$ -			
Materials			$ -					$ -			
Equipment			$ -					$ -			
Travel			$ -					$ -			
Regional/State program fees			$ -					$ -			
QAPP/SAP preparation			$ -					$ -			
Sample collection			$ -					$ -			
Sample laboratory analysis			$ -					$ -			
Third party modeling/analysis/reporting			$ -					$ -			
Training			$ -					$ -			
Other:			$ -					$ -			
Totals			$ -				$ -	$ -		$ -	

Typical Activities	Assumptions and References
QAPP/SAP preparation	
Sample collection	
Sample laboratory analysis	
Data analysis and reporting	
Fee paid for joint monitoring effort conducted by Watershed Group	

Figure 5. Screen Shot of EFC Example Worksheet for a Core Permit Compliance Element

Costs for Future Buildouts

Many municipalities throughout the U.S. are struggling to update existing stormwater systems. In addition, for many, meeting Clean Water Act regulations requires additional infrastructure investments and future system buildouts. Incorporating these costs into an asset management exercise means projecting costs into the future based on what municipal leaders, stormwater managers, and regulators deem necessary to meet future goals for water quality and flood mitigation.

The extent of plans for future buildouts varies widely across communities. In some parts of Western North America, municipalities are planning for significant investments in new stormwater infrastructure, both centralized and distributed, for water quality, drainage and even water supply goals. Within EPA's Region 9, Southern California communities, for instance, have outlined infrastructure investment plans to invest in future urban stormwater systems that meet NPDES requirements, including Total Maximum Daily Loads (TMDLs) of discharges to receiving waters. Some are planning stormwater capture projects for direct use or groundwater recharge. Yet, in other parts of the region, municipalities do not have plans for significant new investments. Thus, future buildout costs may or may not be incorporated in the asset management exercise.

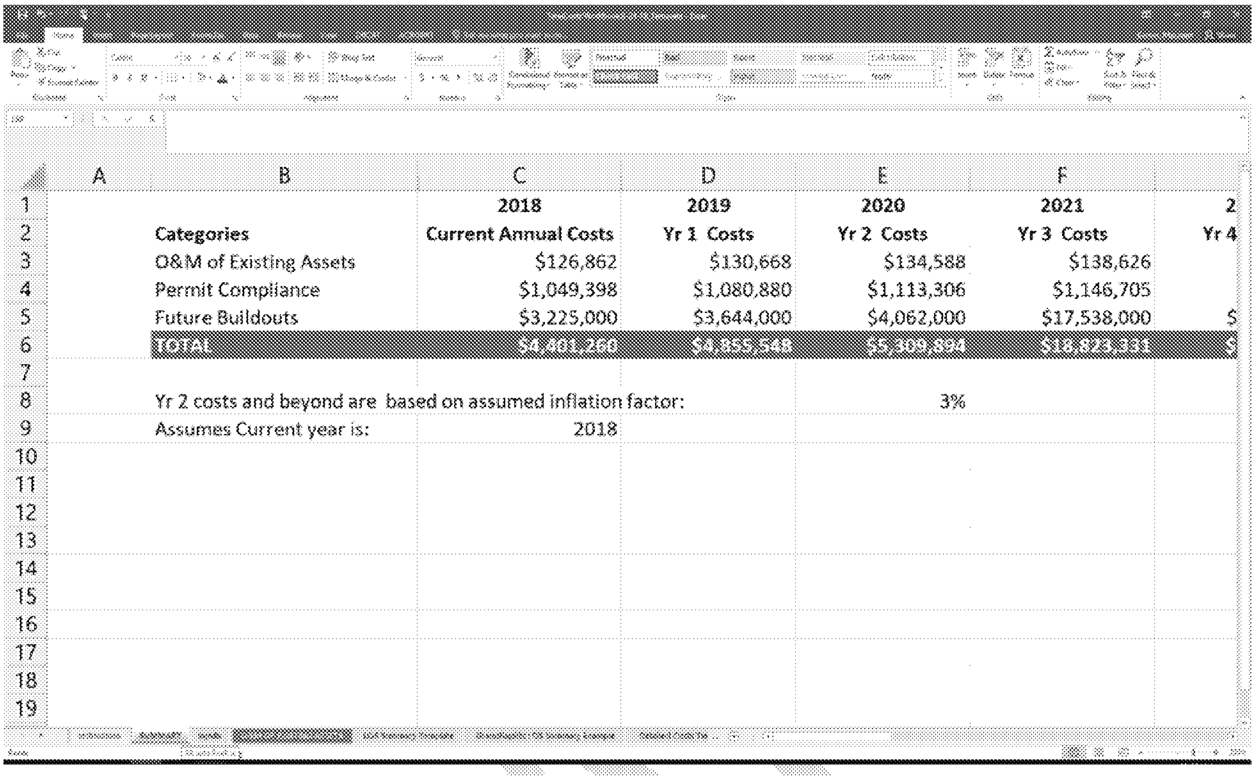
In estimating costs for future buildouts, cost estimates may be *real* or *nominal*. Real costs are adjusted for inflation, whereby the costs of a project in future years can be directly compared to the cost in a current year. Nominal costs, on the other hand, are not adjusted for inflation and are reported as the amount that must be spent in that year, which can be useful when comparing to revenues. Both are valid methods of reporting financial projections, but detailed descriptions of assumptions are necessary to incorporate into asset management.

There are many other factors and methods for projecting future costs, such as whether to report costs as 1) a total dollar amount, 2) a unit cost (dollar amount per value, such as gallons of runoff captured), or 3) life-cycle costs. A unit cost or life-cycle cost approach methods can be useful for comparing project values and investments, but can be quite sophisticated.

The EFC toolkit includes a worksheet for documenting costs associated with future buildouts, based on real, total dollar costs. Attachment A provides future discussion of projecting future expenses using unit or life-cycle costs.

Assembling Total Costs

Once the costs for each of the municipal stormwater program components (existing and future) are estimated, they can be combined to estimate total annual program costs over the next several years. The EFC toolkit's total costs workbook, where all worksheets for permit compliance, existing asset O&M, and future buildout costs reside, includes an extra worksheet that summarizes costs from the other worksheets. Figure 6 shows a screenshot of the EFC total costs workbook summary worksheet.



	2018	2019	2020	2021	2
Categories	Current Annual Costs	Yr 1 Costs	Yr 2 Costs	Yr 3 Costs	Yr 4
O&M of Existing Assets	$126,862	$130,668	$134,588	$138,626	
Permit Compliance	$1,049,398	$1,080,880	$1,113,306	$1,146,705	
Future Buildouts	$3,225,000	$3,644,000	$4,062,000	$17,538,000	$
TOTAL	$4,401,260	$4,855,548	$5,309,894	$18,823,331	$
Yr 2 costs and beyond are based on assumed inflation factor:			3%		
Assumes Current year is:	2018				

Figure 6. Screenshot of the Summary Worksheet in the Total Costs Workbook

II.D. Conducting a Financial Capability Analysis

A Financial Capability Analysis (FCA) estimates economic impacts of stormwater fees on residents, businesses, industry, and the municipal government. The EPA developed an FCA methodology to determine fees for maintaining combined sewer systems, which is detailed in *Combined Sewer Overflows Guidance for Financial Capability Assessment and Schedule Development* (EPA, 1997). In 2012, the EPA Office of Water and Office of Enforcement and Compliance Assurance reevaluated that document and determined the methodology could also be used for separate stormwater and wastewater systems (EPA 2012). The EPA FCA method, which provides a high-level estimate of FCA for residents in a community, is organized as follows:

1. *Estimate the total annual program costs*, which, in the case of storm water quality and drainage, is the sum of the permit compliance costs and the costs for maintaining the chosen LOS.
2. *Determine residential share of costs*. This involves calculating the percentage of the total annual program costs attributable to residential users.
3. *Divide the residential portion of costs by the number of residences*, yielding a Cost per Household (CPH). To determine if the CPH would be a reasonable fee to charge the residences, the EPA developed a term they call the Residential Indicator (RI).
4. *Calculate the Residential Indicator* by dividing the CPH by the Median Household Income (MHI). The RI is the percentage of MHI that would need to be paid as a fee.
5. *Identify a value or range of potential fees*. EPA's 1997 guidance states that if the RI is less than one percent, the financial impact will be low. If the RI is between one and two percent, it is considered mid-range, and over two percent is higher impact. Ultimately, however, these values

are assumptions and can be judged according to community conditions and input. In addition, for water utility services, guidance notes that best practices would simultaneously consider the financial impact of water supply, wastewater, and stormwater costs for a household, rather than consider them each singularly, although no clear guidance exists to benchmark the impact of these combined fees (NAPA, 2017; EPA, 2012). Using the established ranges, if the RI is too large, the project team can reduce the CPH to lower the financial impact. Lowering the CPH could result in a funding gap that can be covered by additional revenue sources. Additional funding sources will be discussed later in this memo.

The MHI is often based on census data for an entire municipality. Using MHI to determine if a proposed fee will cause financial hardship, however, does have drawbacks. The average MHI for municipality can vary widely and is not an equitable measure of affordability for lower-income households (USCM 2014). However, assistance can be offered to low-income customers in the form of a reduced or waived fee depending on income level. The loss of revenue from these households could be balanced by charging higher rates for properties with more average impervious area.

To conduct such estimates, the EFC has used U.S. Census data from the 2014 American Community Survey (ACS) to estimate MHI for communities. The ACS reports MHI at the level of census tracts or block groups (as opposed to an entire municipality). There are typically many block groups within a municipality. For estimating fee impacts, a useful method to address the potential disproportionate impacts of fees on low-income communities within a municipality is to estimate fees in relation to the block group(s) with the lowest reported MHI. Guidance on this and other considerations in developing an equitable fee structure is in the next section

Note also that the data and results from the FCA are valid only for a limited period of time. Program costs and equitable community cost evaluation methods will eventually change substantially, requiring the municipality to reevaluate the FCA.

The EFC toolkit includes means for recording and assessing ability-to-pay data. This FCA exists in the toolkit's rate structure workbook, which is described in the following section. How to gather and asses FCA data is included in that discussion.

II.E. Developing a Rate Structure

Once a CPH has been estimated, a preferred rate structure can be developed. There are several basic methods presented in existing literature (see, for example, the EPA report *Funding Stormwater Programs*, 2009): *Flat fees* per parcel, *Equivalent Residential Unit* (ERU), *Intensity of Development* (IOD), and the *Equivalent Hydraulic Area* (EHA). No one method for a stormwater fee is correct. Communities in the EPA Region 9 territory have used variations of all these methods to apply fees. For instance, in Culver City, CA, residents approved a municipal stormwater fee that is a flat annual rate for each property. As another example, in the City of Sacramento, CA, properties are assessed a charge for drainage services based on building or lot size and land use type. For residences, monthly fees are assigned according to the number of rooms in a household, which is readily available through tax assessor records and aligns with how the local water supply utility traditionally charged for water. Non-residential properties are assessed per unit of area (square-foot) on a property. These are examples of simpler methods for devising stormwater fees, which can be easier to communicate to the public during the approval process and easier for utilities to implement.

The benefits and drawbacks of various options should all be considered as part of the planning process. In providing technical assistance to communities, EFC staff has discussed various options with municipal managers and helped assess the best type of rate structure based on data availability, political feasibility, and management requirements.

EFC projects to date have used versions of the ERU and EHA methods. In 2009, the EPA estimated that ERUs were implemented by more than 80% of stormwater utilities (EPA, 2009). The main advantage of the ERU method is its simplicity to implement and explain to the public. However, the ERU method may not equally distribute the costs of managing stormwater to properties with more impervious surface area than the average, and may not take into account the runoff from pervious surfaces. The ERU method results in billing each customer based on the amount of impervious area on their parcel, which is calculated as follows:

1. A representative sample of buildings in the utility's service area are reviewed to determine the average impervious area of a parcel, which represents one ERU. Traditionally, the ERU has focused on residential buildings, but average imperviousness could be assessed for various other land use categories (e.g., commercial and industrial), which could better align fee assessments with contributing properties.
2. The ERU is assigned a dollar amount based on the CPH calculated during the FCA. If the CPH had a low RI, it is likely the project team will price one ERU equal to the CPH. If there is concern about the financial impact this will have, a fraction of the CPH can be applied.
3. Once an ERU target is established, it can be adapted to meet the needs of a community. For instance, larger residences, multi-family residences and apartment buildings, and commercial and industrial properties could be assessed separately to reflect how a community views the contribution of these properties to stormwater runoff. Commercial and industrial properties could even be assessed on a parcel-specific basis, as there are often many fewer such properties. Such approaches can help create equitable rate structures and potentially reduce financial impacts on lower income households as part of credits and low-income assistance accommodations that are built into the rate structure (discussed in a subsection below).

For large single-family residences, the impervious area of their parcel can be converted to an equivalent amount of ERUs by dividing the total impervious area by the ERU. This requires more initial work than assigning all single-family residences a single fee, but also allows for increased revenue and makes the fee system easier for the public to understand as the fees are directly related to the amount of stormwater generated.

Commercial and industrial properties can be addressed similarly to large residences. The impervious area of the commercial parcel can be converted to ERUs and charged accordingly.

To streamline the billing process and make the rate structure easier to understand for the public, municipalities may decide to implement a tiered rate structure. For example, if one ERU is calculated as 1,000 sf of impervious area, a residential tiered rate structure can be extrapolated by knowing the total lot size of a property, which is typically in assessor data. Assuming that the average imperviousness is consistent across residential lot sizes, the tiered rate could change larger lots a higher fee through multiple ERU tiers as follows.

- <u>1 ERU</u>: 0 sf ≤ Impervious area ≤ 1,250
- <u>2 ERUs</u>: 1,251 sf ≤ Impervious area ≤ 3,000 sf
- <u>3 ERUs</u>: 3,001 sf ≤ Impervious area ≤ 6,000 sf
- <u>4 ERUs</u>: 6,001 sf ≤ Impervious area

This tiered approach can be employed to all properties, or refined to include land use type-specific values.

The following subsections describe:

- Assembling and assessing the necessary data
- Considering credit and discount options
- Comparing, refining, and selecting preliminary rate structures

The EFC toolkit includes a rate structure workbook to be used for developing a rate structure and conducting a fiscal capability analysis. The workbook includes a worksheet template (Figure 7) for tabulating municipal characteristics required for rate structure development. Further discussion on the workbook is provided in the *Identifying a Preferred Rate Structure* section below.

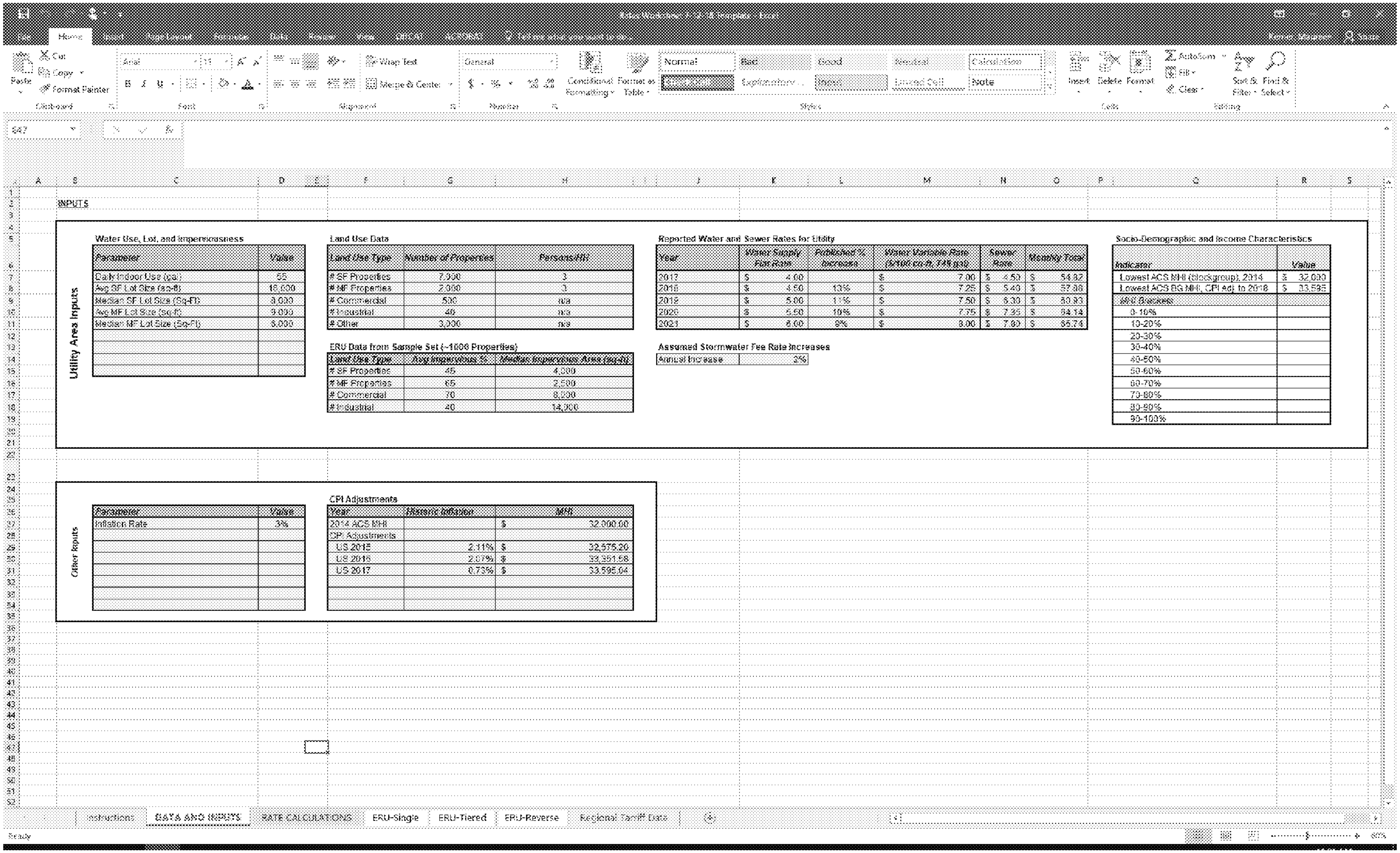


Figure 7. Screen Shot of EFC Data and Inputs Worksheet for Developing a Rate Structure

Gathering, Integrating, and Analyzing Data

Assessing the fiscal impact means collecting data from many sources and estimating impacts for various rate structures. More complex methods require more data collection. In particular, developing a municipal stormwater fee that is based on actual property conditions requires understanding characteristics of impervious surface cover within a municipality. Impervious surface cover can either be estimated for each property, or statistical analysis can estimate the average percentage of cover across parcels. These are used to develop a rate structure, where properties are assessed a unit charge per square footage of surface cover based on property-level estimates or average values across land use types.

In many cases, it is easier to assign properties rate schedules based on assessments of average imperviousness across property types. This requires estimating imperviousness for only a sample set of properties, a much easier task. In developing ERUs to date, the EFC has used this approach, which is described below.

1. Collect geospatial data for parcel boundaries, municipal territories, and land use: The first step is to collect spatial data that supports an analysis of land use distribution in the region looking to enact a stormwater (or other) fee. Municipalities typically have the necessary land use and municipal boundary data, specifically the land uses for each parcel and estimates of lot sizes. Using this data, one can calculated descriptive statistics of land use and lot size broken down by categories such as single-family residential, multi-family residential, commercial, and industrial. In some cases, the local tax assessor's database may be available, which gives additional building and property characteristics. The analysis provides a comparative metric for understanding the validity of derived sample sets.
2. Acquire U.S. Census data for estimating MHI: MHI is an important consideration in assessing the affordability of any fees. The best source of this data is the U.S. Census. Census data from the 2014 American Community Survey (ACS) at the block group level (most recent with high-resolution) ca be downloaded for California and joined to geospatial shape files of block groups. The ACS data reports MHI along with MHI brackets such as 0-10% of the population, 10-20%, etc. For communities assisted by the EFC, the reported average MHI values for each block group in the respective service territory were mapped. Then, the MHI data from the associated block group was joined to the property, yielding a property-level assessment of MHI (with some uncertainty). This allowed for assessing distributions of MHI across properties to the highest level of spatial resolution possible.
3. Analyze geographic dispersion of income, land use, and lot size: The next step is to develop statistical distributions and categorical breakdowns of property characteristics in the service territory. These include analysis by land use and lot size as noted above, along with MHI. Additionally, categorical statistics for multiple criteria such as land use distribution by MHI and lot size by land use type are estimated.
4. Develop a sample set of properties that resemble statistical distributions: To estimate average impervious cover by land use, a representative sample set is needed. The EFC tested several methods, including using a spatially randomized selection of properties and other methods. The chosen method involved selecting properties with a street address ending in the number "1", as it yielded a useful sample that reasonably resembled property-level distributions. This constituted

approximately a 10% sample of properties in a municipality. For instance, in Paso Robles, which has nearly 12,000 properties, approximately 1,000 of them have street addresses that end in the number "1". The data for these properties was extracted and exported for further analysis.

5. Assess impervious surface cover statistics for the sample set of properties: With a sample set assembled, *Google Earth* and *Google Street View* imagery can be used to assess impervious surface cover for each property in the sample sets. *Google Earth* software provides an embedded tool for measuring area, which can be used to assess the area of rooftops, sidewalks, and driveways on a property. Once the full dataset was populated with property-level assessments of impervious surface area (in square-feet), this value is divided by the lot size reported in parcel data to yield the percentage of impervious surface cover. The average imperious surface cover across land use types was recorded, which fed into analysis tools currently under development for devising rate structures and assessing associated equity effects.

The ERF toolkit includes a rate structure workbook that allows municipal program managers to assemble and assess the data for developing rate structures. Further discussion on the workbook is provided in the *Identifying a Preferred Rate Structure* section below. Table 10 lists the various datasets that are needed for the entire EFC rate structure methodology, including property and census data as well as the asset inventory and cost estimates previously discussed in this document.

The procedures outlined above were performed in coordination with a few California communities as part of EFC projects. However, such data analysis can be prohibitive for communities that are receiving technical assistance from consultants. To address this challenge, as of June 2018, the EFC is currently assessing the potential to create an open-source, statewide dataset with parcel-level assessments of impervious surface cover, which could support rate structures based on either parcel-specific assessments or the ERU methodology. That work is on-going, and the assessments of impervious surface cover in sample sets for each of the municipalities is serving as a training data set to assess the accuracy of automating methods to create statewide datasets.

Table 8: Datasets Needed for Asset Management and Rate Structure Development

Dataset	Description	Purpose
Asset inventory	Database of stormwater system assets & characteristics	Supports development of a plan for maintenance scheduling & renewal costs
Stormwater system & program costs	Unit & programmatic costs for stormwater management activities, including inspections, maintenance, & permit compliance requirements	Allows for estimating total costs that must be covered by the incoming revenue portfolio
Property boundaries & assessor data	Geospatial layer of parcel boundaries in the utility service area, & associated tax roll data for land use, lot size, & other characteristics	Supports analysis of imperviousness (average or per property) used to develop a rate structure
U.S. Census block group data	American Community Survey data for socio-demographic and economic characteristics	Provides socio-economic information to assess affordability impacts of rates
Impervious surface cover	The percentage of impervious surface cover for various land use types properties	Used to calculate average or parcel-specific imperviousness required for several types of stormwater fees

Developing Credits and Discounts

A variety of discounts and credits can be offered by municipalities. Discounts provide assistance to households based on financial need, while credit programs incentivize building owners to undertake infrastructure improvements on properties that reduce downstream requirements.

Low-income assistance programs offer relief to offset the burden of fees. They are targeted at households who experience a more significant impact of fees as a percentage of their income. As such, eligibility is usually tied to a total combined annual household income and number of household members. For instance, the California Water Services' low-income credit assistance program provides a discounted fee to households meeting income eligibility requirements (Figure 7). The income threshold increases with household size. Many credit programs across water and electric utilities have similar structures.

Figure 8: Example of a Low-Income Credit Program Eligibility Scale (Cal Water 2018)

Maximum Household Income (effective June 1, 2017 – May 31, 2018)

To be eligible for LIRA, your household's gross annual income may not exceed:

Household Size	Total Combined Annual Income
1-2	$32,920
3	$41,560
4	$50,200
5	$58,840

The credit that eligible households receive can take many forms. For instance, credit options could be exemptions from certain charges, a decreased percentage of a fixed rate charge on a bill, or a lump-sum credit (monthly or annual) provided to households to offset the billed cost-of-services. Ratepayers typically submit supporting documentation, such as a prior-year tax return, to demonstrate eligibility.

Another potentially easier option for providing income-based relief is to include a "zero-rate" style exemption. In this structure, a lower tier of usage is charged at a zero rate, or is essentially free. As an example, for electricity use, a first tier of usage would not be charged, hopefully corresponding to a baseline amount for health and safety. This method assumes an inherent connection between the volume of consumption of a resource and income, whereby medium- and high-income households consume more and the zero-rate structure provides a built-in subsidy. This may not be entirely applicable to households for stormwater.

Table 11 compares zero-rate and income-based options for credits and discounts.

Realize, however, that utilities must compensate for the revenue lost by low-income assistance programs. They can accomplish this by raising fees in other rate tiers or including a fixed charge for low-income assistance. One innovative mechanism is to have an opt-in program, where ratepayers contribute to the fund voluntarily. As an example, utilities in North Carolina use a "round up" opt-in program to support a low-income assistance fund. The program provides rate payers to opportunity to round up their bills to the nearest dollar, with the balance between the billed amount and the collected amount going into the income assistance fund.

Table 9: Categories of Income-Based Assistance for Ratepayers

Option	Summary	Advantages	Disadvantages	Examples
Zero-rate	No residential unit will be charged for Stormwater Fees, regardless of income or household size. Higher tiers will be charged a positive rate. Benefits inversely proportional to income.	Money not spent on administration, public outreach, or law enforcement for residential eligibility. Easier to calculate revenue from household units.	Would not proportionally benefit low income persons and/or larger household size. Non-residential units pay more to compensate for residential unit water usage. Less stormwater usage data and behavior.	Charging revenue based taxes on commercial and industrial sites.
Income Based Exemption or Credit	Ratepayers demonstrate eligibility and apply to program. Post-review and approval, lower bills or end-of-year credit is given to the ratepayer.	Can have targeted relief for low income ratepayers, account for household size, and scale benefits for income level.	Need to allocate money to manage program and spread program awareness to low income audience. Commit legal department to deal with appeals for applications. Delays in document processing. Would need annual applications to account for fluctuating annual income. Low political support.	Eligibility options: already being enrolled in a low income credit assistance program, and not exceeding gross annual income bracket per household size.

Many communities offer credits to rate payers for stormwater management-related activities that are not income-based. For example, a residence with disconnected roof downspouts could receive a 25% discount on their fee. The installation of a properly constructed rain garden could reduce the fee by a percentage equivalent to the estimated percent capture based on its size. Total discounts should be limited to something less than 100% as NPDES compliance costs will exist even if all properties can demonstrate 100% containment of stormwater.

Identifying a Preferred Rate Structure

The process of identifying a set of promising rate structures is iterative. Generated revenues must cover a desired portion of the total costs for program management, but there is no guidance for the exact percentage that should be covered. The enacting governing body, such as a city council or county board of supervisors, must ultimately decide that the proposed tax or assessment structure is fair and appropriate. Comparisons with nearby communities can help gauge the feasibility of the rate structure.

The EFC surveyed some local examples of existing stormwater fee and assessment structures for California. Additionally, Western Kentucky University annually publishes a comprehensive survey of existing stormwater fees from throughout the U.S., providing background information on rate structure approaches and a detailed appendix of historic stormwater fees (Campbell 2016). Finally, assessments of political feasibility also require public input. In some communities, voters directly approve municipal revenue-generating proposals, so any rate structure must be capable of gaining support. All of these considerations must be considered in selecting one or more preferred rate structures.

The EFC toolkit features support the iterative process of identifying viable rate structures. After collecting and analyzing the relevant information on community characteristics and existing infrastructure, the r*ate structure workbook* (Figure 9) allows a user to input varying fee amounts and assess the associated amount of revenue that could be generated, or use the opposite procedure to derive rates from a preferred amount of total revenue. The estimated program costs for permit compliance, existing management, and future buildouts can be directly compared to revenue estimates from the rate structure workbook, providing a basis for discussion among utility managers and municipal leaders regarding expectations for the stormwater program.

Toolkit to Support Financial Planning for Municipal Stormwater Programs

US EPA Region 9 Environmental Finance Center at Sacramento State

August 2018

RATES ANALYSIS: Based on an Equivalent Residential Unit of Imperviousness (Single Rate)

6/27/2018

CSUS Office of Water Programs
Environmental Finance Center

ERU Structure

Tiers (Changes by Property Type)	# of SF Properties	# of MF Properties	Commercial	Industrial
1 ERU	4000	700	700	5
2 ERUs	2000	800	200	1
3 ERUs	1000	300	500	25

PROGRAM REVENUE PROJECTIONS*

	Year	1	2	3	4	5
Residential	Estimated Charge (based on 55 gpd indoor, sewer)	$ 54.82	$ 57.88	$ 60.93	$ 64.14	$ 66.74
	Stormwater Tariff (1 ERU)	$ 2.15	$ 2.19	$ 2.24	$ 2.28	$ 2.33
	Monthly Bill Estimate (w/ reported rate increases)	$ 56.97	$ 60.07	$ 63.17	$ 66.42	$ 69.07
	Annual Bill Estimate (w/ reported rate increases)	$ 684	$ 721	$ 758	$ 797	$ 829
	Subtotal: Revenues from SF Properties	$ 283,800	$ 289,476	$ 295,266	$ 301,171	$ 307,194
	Subtotal: Revenues from MF Properties	$ 82,560	$ 84,211	$ 85,895	$ 87,613	$ 89,366
Commercial & Mixed Use	*Subtotal: Revenues from Comm-MU Properties*	$ 67,080	$ 68,422	$ 69,790	$ 71,186	$ 72,610
Industrial	*Subtotal: Revenues from Industrial Properties*	$ 2,116	$ 2,158	$ 2,201	$ 2,245	$ 2,290
TOTALS	STORMWATER PROGRAM REVENUE	$ 435,556	$ 444,267	$ 453,152	$ 462,215	$ 471,459

<< Input Decision Variable

TOTALS ACROSS ERU CATEGORIES

	Year	1	2	3	4	5
SF Residential	Subtotal: ERU Tier 1	$ 103,200.00	$ 105,264.00	$ 107,369.28	$ 109,516.67	$ 111,707.00
	Subtotal: ERU Tier 2	$ 103,200.00	$ 105,264.00	$ 107,369.28	$ 109,516.67	$ 111,707.00
	Subtotal: ERU Tier 3	$ 77,400.00	$ 78,948.00	$ 80,526.96	$ 82,137.50	$ 83,780.25
MF Residential	Subtotal: ERU Tier 1	$ 18,060.00	$ 18,421.20	$ 18,789.62	$ 19,165.42	$ 19,548.72
	Subtotal: ERU Tier 2	$ 41,280.00	$ 42,105.60	$ 42,947.71	$ 43,806.67	$ 44,682.80
	Subtotal: ERU Tier 3	$ 23,220.00	$ 23,684.40	$ 24,158.09	$ 24,641.25	$ 25,134.07
Commercial & Mixed Use	Subtotal: ERU Tier 1	$ 18,060.00	$ 18,421.20	$ 18,789.62	$ 19,165.42	$ 19,548.72
	Subtotal: ERU Tier 2	$ 10,320.00	$ 10,526.40	$ 10,736.93	$ 10,951.67	$ 11,170.70
	Subtotal: ERU Tier 3	$ 38,700.00	$ 39,474.00	$ 40,263.48	$ 41,068.75	$ 41,890.12
Industrial	Subtotal: ERU Tier 1	$ 129.00	$ 131.58	$ 134.21	$ 136.90	$ 139.63
	Subtotal: ERU Tier 2	$ 51.60	$ 52.63	$ 53.68	$ 54.76	$ 55.85
	Subtotal: ERU Tier 3	$ 1,935.00	$ 1,973.70	$ 2,013.17	$ 2,053.44	$ 2,094.51
TOTALS	Total revenue (should match above)	$ 435,556	$ 444,267	$ 453,152	$ 462,215	$ 471,459

HOUSEHOLD AFFORDABILITY**

	Analysis of Household Affordability					
Blockgroup with Lowest MHI (Most Vulnerable)	*Associated MHI Threshold for Total Monthly Bill*					
	1%	$ 68,368.24	$ 72,085.13	$ 75,803.06	$ 79,702.03	$ 82,882.09
	2%	$ 34,184.12	$ 36,042.56	$ 37,901.53	$ 39,851.02	$ 41,441.04
	Annual Expense of 2018-Adjusted MHI Threshold ($35,432)					
	1%	$ 346.03	$ 356.11	$ 366.19	$ 376.26	$ 386.34
	2%	$ 692.06	$ 712.21	$ 732.37	$ 752.53	$ 772.69
	Disparity					
	1%	$ 337.65	$ 364.74	$ 391.84	$ 420.76	$ 442.48
	2%	n/a	$ 8.64	$ 25.66	$ 44.49	$ 56.13

* Based on nominal costs (in that year) of rates using published rate increases and no additional inflation considerations
** Based on nominal values of Median Household Income values in each year using 3% inflation rate

Figure 9. Screen Shot of EFC Rate Structure Worksheet

II.F. Determining the Funding Gap and Additional Revenue Options

The funding gap between estimated costs and the selected revenue option can be determined by subtracting the final annual utility revenue from the total annual program costs. If a gap exists, municipal managers can explore additional revenue options to bridge the gap. The options, many of which were introduced in Section I, include:

1. *Local Development Fees*. Municipalities directly charge developers a variety of fees for newly connecting to existing systems, inspection and permitting activities, reviewing site plans, mitigation and impact assessments, and other activities.
2. *Bonds*. Municipalities and state regularly use bonds to fund infrastructure development. Through bonds, governments raise revenue and agree to pay back the fronted cost of capital over time with interest. A variety of bonds are relevant for stormwater infrastructure development, including general obligation bonds, popularly-approved bond propositions (especially in California), and "Green Bonds" that are designated specifically for projects with environmental benefits, and recent "Environmental Impact Bonds" that assemble public and private partners to build and maintain systems over time to meet water quality goals.
3. *Federal and State Loan Programs*. The Clean Water State Revolving Fund is an example of a federal-state revolving loan program that provides an application-based source of capital for building projects, which must be paid back over time. In many states, federal and state funds both contribute to monies available for distribution.
4. *Government Grant Programs*. Some states provide grant programs for specific tasks related to stormwater management. For instance, in California, the Integrated Regional Water Management Grant program offers grants for watershed management activities. The grant programs are funded through general funds or other sources.
5. *Local Sales Taxes*. In some jurisdictions, a special-purpose sales tax has been enacted, whose revenues are earmarked for a specific task such as developing stormwater infrastructure. As an example, the Los Angeles region of California passed Measure M in 2016, which designated $860 million of annual revenue from a $0.05 sales tax to transportation projects.
6. *Environmental Quality and Remediation Grant Programs*. Some federal and state grant programs fund specific tasks related to stormwater permit compliance (NPDES activities) or environmental cleanup. Examples include the Clean Water Act's 319(h) NPS Grant Program that funds activities, monitoring, and outreach.
7. *Designated Special Districts*. Some western states have various types of "special districts" that are approved to fulfill a designated purpose, such as managing stormwater infrastructure, and have taxable authority within a jurisdiction that may or may not align with other jurisdictions. In California, Benefit Assessment districts, designated in 1982, provide authority of local governments and other entities to finance municipal infrastructure and operations.

The availability of options varies across states, depending on local legislative acts that provide additional mechanisms of authority to unilaterally or jointly raise funds and implement taxes. A number of resources currently exist that provide significant detail on these options. The USEPA hosts the Water Finance Clearinghouse with a repository of qualitative and quantitative information on funding water infrastructure in the U.S. In 2018, the California State Water Resources Control Board released a document of existing stormwater funding options especially relevant for California (STORMS 2018). Additionally, in

2019, the California Stormwater Quality Association solicited proposals to build a web-based resource portal with financing options for stormwater program management and infrastructure funding. The growing list of available resources supports municipalities as they build capacity for organized stormwater management programs.

Many stormwater-related projects can potentially be subsidized by other agencies or municipal departments based on assessment of mutual benefits for all contributing parties. Some example projects are, implementing capture and use projects, using stormwater to maintain minimum sewer flows, installing trash capture devices, and performing street sweeping.

Finally, if all revenue options have been exhausted, a method for bridging the funding gap is to lower the LOS and associated stormwater program annual cost. Similar to determining a reasonable CPH this process can be iterative, several iterations may be necessary to achieve a satisfactory LOS at an acceptable cost. If this is deemed necessary the project team will determine a new LOS or redefine a proposed LOS.

II.G. Disseminate Information and Engage Stakeholders

Ultimately, a stormwater financing plan will need support and/or approval of several stakeholders. The methods described above and the EFC toolkit, as developed, are intended to provide program managers a starting point to develop a preliminary financing plan that can be shared and used to begin informed conversations. A document similar to that developed by Grand Rapids (2016) may be useful for conversations with municipal managers and certain stakeholders seeking detailed methodologies and assumptions. To facilitate general public support, a public information program should be outlined. The goal of such program is to educate community leaders, decision-makers, and the public about the need for a stormwater fee and the benefits to the community a properly funded stormwater program will bring. Elements of this program could include: public meetings, informational pamphlets, a website, and an advisory committee (EPA, 2009). The City of Palo Alta, who approved a stormwater utility in 2017, provides a good example of communicating stormwater fee needs, planning, and community outreach using web pages: https://www.cityofpaloalto.org/news/displaynews.asp?NewsID=3679.

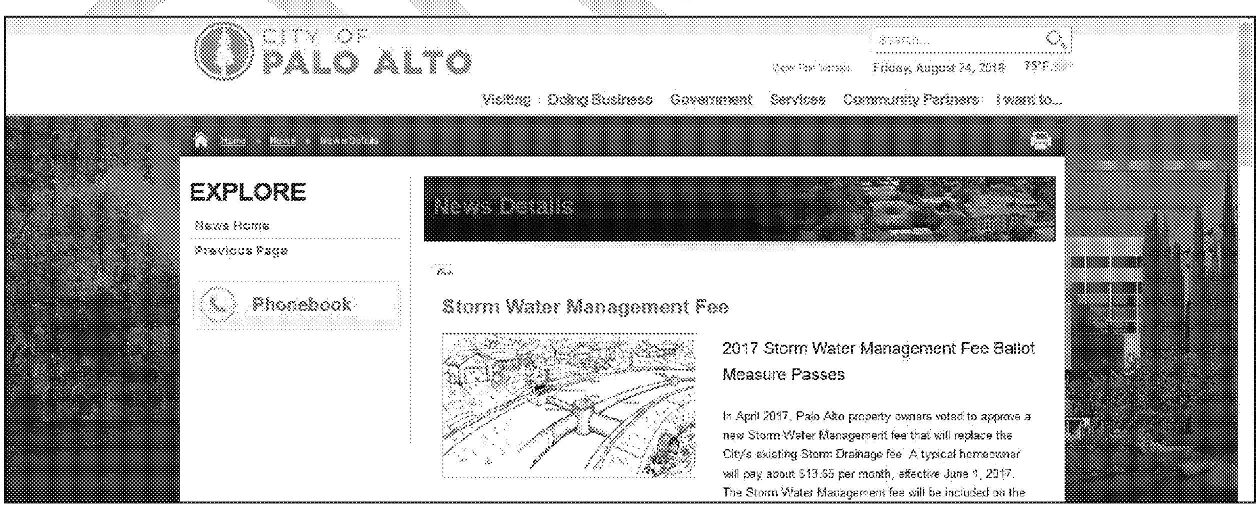


Figure 10. City of Palo Alto Website Communicating Stormwater Fee Process

III. Preview of the EFC Stormwater Financing Toolkit

The toolkit consists of three workbook templates to support development of a stormwater utility fee:

1. ***Asset Inventory Workbook***
2. ***Total Costs Workbook***
3. ***Rate Structure Analysis Workbook***

The workbooks and associated contents were highlighted throughout Section II, and are further summarized below. The workbooks were created to support step-by-step procedures. They generally fit together as shown in Figure 11. Each workbook has an "Instructions" tab with more details.

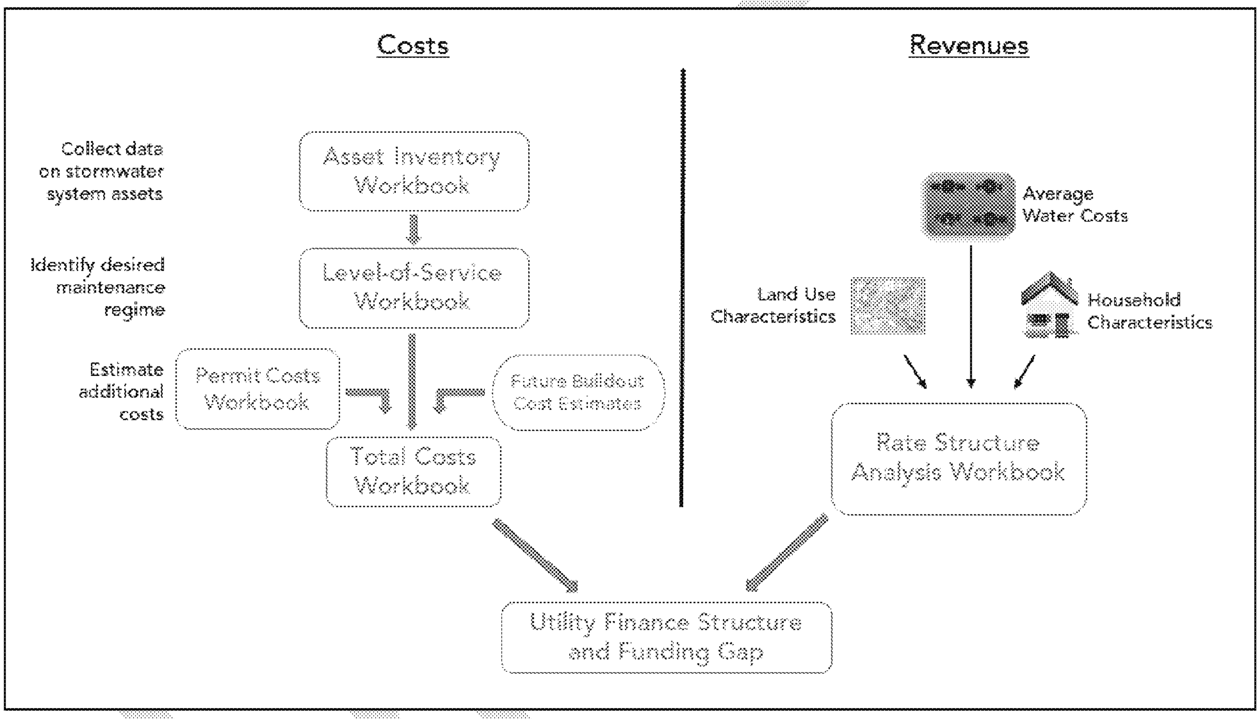


Figure 11. Content and Flow of EFC's Stormwater Financing Toolkit

III.A. Asset Inventory Workbook

The asset inventory workbook is intended to list all asset and relevant information in order to prioritize them for maintenance and replacement. The information entered in and calculated by the asset inventory workbook can be used to develop O&M schedules and then costs estimates. The workbook includes the following worksheets:

- **Instructions**: descriptions of how to use the workbook
- **Asset Inventory Worksheet**: table listing each asset and various characteristics. The characteristics are used to calculate POF and COF scores, which in turn are used to prioritize assets for maintenance and replacement.
- **Multi Factor COF Worksheet**: table recording asset characteristics such as proximity to floodplains, buildings, or contaminated soils, than can be used to quantify a COF score.

Alternatively, a single factor COF quantitative measure (ranging negligible to severe) can be selected on the asset inventory worksheet to calculate the COF score, making the multi factor COF worksheet unneeded.

- **Prioritization Worksheet**: table summarizing and sorting the assets and characteristics by a combined POF and COF score
- **References**: tables summarizing assumptions and values used in look up functions in the asset inventory and multi factor COF worksheets

III.B. Total Costs Workbook

The *Total Costs Workbook* computes an annual sum of costs for O&M of existing assets, permit compliance activities, and future new infrastructure.

The total costs workbook includes the following worksheets:

- **Instructions**: descriptions of how to use the workbook
- **Summary**: table summarizing costs entered and calculated in other worksheet for 1) O&M of existing assets, 2) permit compliance, 3) future buildout. Costs for future O&M and permit compliance activities are also presented. They are projected using an inflation factor entered on the Inputs worksheet (see below).
- **Inputs**: placeholders for manually entered data such as assumed inflation factor for projecting future costs and year of initial cost estimates.
- **O&M Costs for Existing Assets**: table summarizing costs for O&M of existing assets based on LOS's defined and their costs estimates from following worksheets
    - **LOS Summary Template**: table summarizing O&M activities and costs for various asset categories and LOS's
    - **Grand Rapids LOS Summary Example**: example of how the LOS Summary Template can be populated
    - **Detailed Costs Template**: tables detailing specific costs (labor, material, etc.) for O&M activities used to tabulate costs in LOS Summary Template
- Permit Costs Summary: table of costs for permit compliance activities, based on detailed cost estimates from the following worksheets
    - **Permit Category 1 Costs**: costs for construction site stormwater control compliance
    - **Permit Category 2 Costs**: costs for illicit discharge detection and elimination compliance
    - **Permit Category 3 Costs:** costs for industrial and commercial management compliance
    - **Permit Category 4 Costs:** costs for pollution prevention of municipal operations
    - **Permit Category 5 Costs:** costs for post construction stormwater management compliance
    - **Permit Category 6 Costs:** costs for public education, outreach, involvement, and education
    - **Permit Category 7 Costs:** costs for water quality monitoring
    - **Permit Category 8 Costs:** costs for overall stormwater program management
    - **Permit Category 9 Costs:** costs for long-term planning (e.g., TMDL compliance or watershed management collaboration)
- **Future Buildout Costs:** table summarizing costs of projects to be constructed in the future.

III.C. Rate Structure Analysis Workbook

The *Rate Structure Analysis Workbook* includes a generalized method for quantifying the potential revenue from implementing flat fee or equivalent residential unit (ERU) assessments for a community. It aggregates several data sets, which must be collected:

1) Land use and parcel data in a municipality
2) Estimates of household income
3) Existing household costs for water and wastewater utility services

The rate structure analysis workbook includes the following worksheets:

- **Instructions**: descriptions of how to use the workbook
- **Data and Inputs**: tables recording
  - water use, property sizes, and imperviousness data
  - land use data
  - water and sewer utility rates
  - inflation rates
  - assumed stormwater fee increases
- **ERU-Single**: tables that project potential revenue for user entered ERU single rate assumptions and calculate the percent of MHI as a measure of affordability
- **ERU-Tiered**: tables that project potential revenue for user entered ERU tiered rate assumptions and calculate the percent of MHI as a measure of affordability
- **ERU-Reverse**: tables that calculate an ERU based on required revenue
- **Regional Tariff Data**: tables summarizing stormwater utility fees and rate structures implemented by various municipalities in California and the U.S.

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Attachment A: Projecting Future Costs

US EPA Region 9 Environmental Finance Center at Sacramento State
August 2018

In projecting future costs, financial best practices should be used. The task of projecting future costs is always subject to assumptions and selected methods. Cost estimates should clearly state whether they are *real* or *nominal*. Real costs are adjusted for inflation, whereby the costs of a project in future years can be directly compared to the cost in a current year. Nominal costs, on the other hand, are not adjusted for inflation and are reported as the amount that must be spent in that year, which can be useful when comparing to revenues. Both are valid methods of reporting financial projections, but detailed descriptions of assumptions are necessary to incorporate into asset management.

Costs of future projects may be reported as total capital costs and/or as unit values. Total costs are the full amount to be spent on a project, which must often be provided to builders up front and is subsidized by revenue from an investment or bond. However, to compare the financial feasibility of various options, total costs are often converted to unit costs as well, which can allow for comparing various new options, along with benchmarking to existing infrastructure costs. Unit costs can be reported as:

1) *Capital costs per projected capacity*, which is the total design and construction cost divided by a projected numerical output, such as volume of water captured or volume of water treated. This helps gauge the efficiency and viability of the actual construction process.
2) *Long-term performance costs*, which account for the projected returns that a project will yield. This allows decision-makers to understand the expected long-term returns for a project that must be paid for now but financed over the long-term.

While project costs for infrastructure occur up front, such investments yield long-term returns. These are captured by annualizing costs over a long period of time that is equal to the estimated lifetime of the new project. The lifetime unit costs would be the total costs (construction and long-term maintenance) divided by the total lifetime expected capacity or output. The unit costs can also be annualized based on an assumed discount rate to account for the changes in the value of money over time. The EFC has provided guidance to communities in standardizing estimates for current and future costs.

Notably, estimates of future costs should be for new infrastructure that 1) meets water quality and flood control/drainage goals and 2) is under municipal control. Costs to municipalities for future build outs on private lands, which are directly covered by private development fees, would not be included in the assessment through this approach.

The unit cost metrics help in comparing options in terms of benefits and value, but cost estimates and accounting can become even more detailed. For instance, the costs of a given project can be estimated in terms of output variability. Each project will have some mix of both *fixed* costs, which do not change with size or operational parameters, and *variable* costs, which do change with operational modifications. These combine to yield a cost-curve that relates size or output with unit costs. When building a new water project, the size is often a critical design decision. Larger projects, while more expensive, often yield lower unit costs.

Other even more advanced and data-intensive accounting methods exist. *Life-cycle cost accounting* includes costs for building, operating, and maintaining a piece of infrastructure over time that incorporates the multitude of operational considerations and monetized benefits over the expected timeframe of the infrastructure. Such accounting can be expanded even further to include *multiple* *benefits* that are not necessarily monetary. For stormwater, such life-cycle and multi-benefit assessments are just starting to be used by municipal and county governments in project planning. The EFC tools support cost estimates that include life-cycle costs, but at this time do not directly help accumulate multi-benefit quantifications, which can often be highly-project specific.